Socio-Technical Perspectives on Digital Photography
Scientific Digital Photography Use
by Marine Mammal Researchers

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Marine Mammalogy

Cetaceans

Pinnipeds

Manatees

Sea otters

Figure 2: Marine mammals
Photo-identification

- Humpback whales
Photo-identification

- Dolphins
Marine Mammal Protection Act of 1972

Prohibitions

16 U.S.C. 1372

Sec. 102. (a) [TAKING.] — Except as provided in sections 101, 103, 104, 109, 111, 113, 114, and 118 of this title and title IV, it is unlawful—

(1) for any person subject to the jurisdiction of the United States or any vessel or other conveyance subject to the jurisdiction of the United States to take any marine mammal on the high seas;

Exceptions (including harassment) require permits

(16 USC Sec. 1374)
Origins of photo-identification

- “The original seed of the idea...came from talking around the campfire... It was one of these fun things where ideas come to fruition independently due to synergism and the overall status of the sciences. In the 50s, I don’t think anyone would have really come up with that idea... I remember telling [a prominent scientist in 1971] about this idea of photo-identifying, and he said, ‘Don’t do it. It is not worthwhile. You’re barking up the wrong tree. You can’t do it, you’ll be disappointed. The only way to do it is to catch them and brand them.’ But, of course, they use photo-identification now very successfully.”

- Respondent discussing development of photo-id methods in the 1970s
Methods

- Multi-site case study
- ‘Following a thing’ (Marcus, 1995)

Table 3: Research sites and number of participants

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Acronym</th>
<th>Type of organization</th>
<th># of scientists*</th>
<th># interviews</th>
<th>Type of interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Coast Marine Center</td>
<td>AMC</td>
<td>Large non-profit</td>
<td>6-20</td>
<td>1</td>
<td>Telephone</td>
</tr>
<tr>
<td>Atlantic Dolphin Research Institute</td>
<td>ADRI</td>
<td>Large non-profit</td>
<td>21-100</td>
<td>4</td>
<td>In-person</td>
</tr>
<tr>
<td>Canadian Science Center</td>
<td>CSC</td>
<td>Government agency</td>
<td>6-20</td>
<td>1</td>
<td>Telephone</td>
</tr>
<tr>
<td>Coast College</td>
<td>CC</td>
<td>Liberal arts college</td>
<td>&lt;5</td>
<td>2</td>
<td>In-person</td>
</tr>
<tr>
<td>Dolphin Bay Center</td>
<td>DBC</td>
<td>Small non-profit</td>
<td>&lt;5</td>
<td>2</td>
<td>In-person</td>
</tr>
<tr>
<td>Federal Marine Agency</td>
<td>FMA</td>
<td>Government agency</td>
<td>100+</td>
<td>4</td>
<td>In-person</td>
</tr>
<tr>
<td>Gulf Coast Research Institute</td>
<td>GCR</td>
<td>Large non-profit</td>
<td>21-100</td>
<td>4</td>
<td>In-person</td>
</tr>
<tr>
<td>Northern Pacific University</td>
<td>NPU</td>
<td>Teaching university</td>
<td>6-20</td>
<td>1</td>
<td>Telephone</td>
</tr>
<tr>
<td>Pacific Whale Project</td>
<td>PWP</td>
<td>Mid-sized non-profit</td>
<td>6-20</td>
<td>8</td>
<td>In-person</td>
</tr>
<tr>
<td>Southern Gulf University</td>
<td>SGU</td>
<td>Research university</td>
<td>6-20</td>
<td>9</td>
<td>In-person</td>
</tr>
<tr>
<td>South European Dolphin Center</td>
<td>SEDC</td>
<td>Small non-profit</td>
<td>&lt;5</td>
<td>1</td>
<td>In-person</td>
</tr>
<tr>
<td>U.S. Marine Agency</td>
<td>USMA</td>
<td>Government agency</td>
<td>6-20</td>
<td>3</td>
<td>In-person</td>
</tr>
<tr>
<td>Whale Canada</td>
<td>WC</td>
<td>Small non-profit</td>
<td>&lt;5</td>
<td>1</td>
<td>Telephone</td>
</tr>
<tr>
<td>Total sites = 13</td>
<td></td>
<td></td>
<td></td>
<td>41</td>
<td></td>
</tr>
</tbody>
</table>

* Only includes scientists involved in marine mammal research. Some of the studies are part of much larger organizations that support a wide variety of marine research activities and, in some cases, public outreach such as education programs and aquariums. All numbers are estimations based on participant-provided information.
Participants

46 Technicians (n=13), mean age=27.5, range=20-35, s.d.=4.1
Researchers (n=14), mean age=33.7, range=27-45, s.d.=6.2
Investigators (n=14), mean age=55.6, range=50-62, s.d.=4.0

Table 5: Number and length of interviews

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Mean</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviews</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of interviews</td>
<td>54:00</td>
<td>1:19</td>
<td>0:33 – 3:13</td>
</tr>
<tr>
<td>Length of transcripts</td>
<td>1,132</td>
<td>28</td>
<td>12 – 63</td>
</tr>
<tr>
<td>Words in transcripts</td>
<td>480 K</td>
<td>12 K</td>
<td>5 – 27 K</td>
</tr>
</tbody>
</table>

Table 6: Research database summary

<table>
<thead>
<tr>
<th>Source documents</th>
<th># of items</th>
<th>Total pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviews</td>
<td>41</td>
<td>1132</td>
</tr>
<tr>
<td>Photographs</td>
<td>405</td>
<td>405</td>
</tr>
<tr>
<td>Taken during research</td>
<td>246</td>
<td>246</td>
</tr>
<tr>
<td>Provided by research subjects</td>
<td>159</td>
<td>159</td>
</tr>
<tr>
<td>Documents</td>
<td>115</td>
<td>1098</td>
</tr>
<tr>
<td>Internal communications</td>
<td>24</td>
<td>280</td>
</tr>
<tr>
<td>Provided by research subjects</td>
<td>92</td>
<td>818</td>
</tr>
<tr>
<td>Total</td>
<td>561</td>
<td>2635</td>
</tr>
</tbody>
</table>
## Research Questions

1. Who are the relevant actors within the systems supporting photo-identification research, and what are the core groups both related and unrelated to photography to which these actors belong?

2. What are the pressures/incentives or impediments to adopting digital techniques?

3. How is knowledge about how to use digital photography technology obtained (e.g., is it formal or informal, what role do other researchers play, who in the scientist’s networks participate in the learning)?

4. What are the resource flows (e.g., to pay for equipment, staff, field work, new specialists in digital technology, etc...) that the scientists have mobilized to pay for their photo-identification work?

5. Who becomes involved in the photo-id process for the first time when scientists adopt digital photography; which formerly involved actors and technologies are excluded; and how are peripheral actors affected?

6. What conflicts arise over the digital photography computing package in routine use, and what are the biggest benefits of digital photography in routine use?

7. How are the data shared with other scientists?

8. What are the architectural choice points for the system (e.g., what choices are made over time that influence the current configuration of the computing package), and what are the rejected alternatives? What are the other elements of the total computing package (e.g., databases, GPS, etc...) used to support photo-identification? Have these changed?

9. What technological alternatives would be desirable to improve the existing system (e.g., if one were not limited to existing technology, what sort of system could respondents imagine that would make their research more effective)?
Data in the field
Matching techniques on screen
Matching techniques on paper
Photo-identification

- Humpback whales
Organizing digital photos
Organizing digital photos
6.2.1 Research question 1: Relevant actors and core groups

1. Who are the relevant actors within the systems supporting photo-identification research, and what are the core groups both related and unrelated to photography to which these actors belong?

**Table 8: Actors, actants, and core groups**

<table>
<thead>
<tr>
<th>Actors</th>
<th>Non-human actants</th>
<th>Core groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigators</td>
<td>Photography systems</td>
<td>Professional societies</td>
</tr>
<tr>
<td>Researchers</td>
<td>Information systems</td>
<td>Trans-species communities of practice</td>
</tr>
<tr>
<td>Technicians</td>
<td>Animals</td>
<td>Species-specific communities of practice</td>
</tr>
<tr>
<td>Field support personnel</td>
<td>Ecosystems</td>
<td>Organizations / Employers</td>
</tr>
<tr>
<td>IT Staff</td>
<td>Governmental organizations</td>
<td>Peer networks / collaborations</td>
</tr>
<tr>
<td>Volunteers</td>
<td>Non-governmental organizations</td>
<td></td>
</tr>
<tr>
<td>Philanthropists</td>
<td>Funding agencies</td>
<td></td>
</tr>
</tbody>
</table>
6.2.5 Research question 5: Included and excluded actors

5. Who becomes involved in the photo-id process for the first time when scientists adopt digital photography; which formerly involved actors and technologies are excluded; and how are peripheral actors affected?
Photo-id process: film

LEGEND

- Time = relative size of arrow (thick=longer time)
- In field
- At lab
- External to project
Photo-id process: digital

LEGEND

- Time = relative size of arrow (thick=longer time)
- Green: In field
- Yellow: At lab
- White: External to project

1. Field photos
2. Download, backup, initial organizing
3. Labeling and organizing
4. Data entry
5. Printing (in some cases)
6. Identification
7. Analysis

Summary logs
Photo-id process: digital

- Quick feedback
- Less loss of data
- More time at end of long days

**LEGEND**
- Time = relative size of arrow (thick = longer time)
- In field
- At lab
- External to project

**Process Flow**

1. Field photos
2. Download, backup, initial organizing
3. Summary logs
4. Labeling and organizing
5. Data entry
6. Identification
7. Analysis
8. Printing (in some cases)
Photo-id process: digital

Field photos → Download, backup, initial organizing → Labeling and organizing → Data entry → Identification → Analysis

LEGEND
- Time = relative size of arrow (thick = longer time)
- In field
- At lab
- External to project

3-4 times as many photographs

Printing (in some cases)
Photo-id process: digital

LEGEND
- Time = relative size of arrow (thick = longer time)

- In field
- At lab
- External to project

- Field photos
- Download, backup, initial organizing
- Summary logs

- Printing (in some cases)
- Data entry
- Identification
- Analysis

- Database designers
- IT staff
- Skilled users
Photo-id process: digital

LEGEND
- Time = relative size of arrow (thick = longer time)
- In field
- At lab
- External to project

Field photos → Download, backup, initial organizing → Labeling and organizing → Data entry → Printing (in some cases)

Summary logs -> 2-3 times as many animals

Identification → Analysis
Photo-ID process: Changes

- Instant feedback
- Efficiency
- Better coverage
- Less selective shooting styles

- Quick feedback
- Less loss of data
- More time at end of long days
- Storage issues

- More photographs
- More complex info systems

- Field photos
- Download, backup, initial organizing
- Labeling and organizing
- Data entry
- Printing (in some cases)

- Summary logs
  - Less detail
  - Less tedium

- Identification
  - Database designers
  - IT staff
  - Skilled users

- Analysis
  - More animals
  - Larger catalogs
  - Better health

LEGEND
- Time = relative size of arrow (thick = longer time)
- In field
- At lab
- External to project

- Quick feedback
- Less loss of data
- More time at end of long days
- Storage issues

- More photographs
- More complex info systems

- Database designers
- IT staff
- Skilled users

- More animals
- Larger catalogs
- Better health
Who does the work?

Often volunteer labor

Film

Field photos → Printing or sleeving → Labeling → Organizing

Shot logs

Digital

Field photos → Download, backup, initial organizing → Labeling and organizing → Data entry

Summary logs

Permanent employees
6.2.7 Research question 7: Data sharing

7. How are the data shared with other scientists?
Dr. Marcia Parrett: It just it’s complicated – so, right now I have two data bases; one on my older data from 2003 back, which was all of the data collected on film, and now I have a new…database that’s all the data collected on digital.. So, this spring, I’m actually going to [location]…and we have a collaborative agreement where we share data back and forth and we’d kept it pretty much in the same format except we need to get more on the same page and we’re going to work with their computer guy up there at the end of May and really get our databases uniform. Maybe then, it won’t be all…the data won’t be the same but they’ll be the same format.
Idiosyncratic systems
The Standards Issue

Robert Newton: And if you don’t have a really good filing system standardized, that doesn’t change every time someone thinks it might be better done a different way. So I’m kind of waiting, I guess, to see it really stabilizes with a naming protocol and a filing protocol that is not going to wander every time someone comes up with a new software for digital pictures. That happens frequently and you’ll get, people send us pictures off a camera and they’ll be in files maybe a Canon software, or a Nikon one. And you can convert them all to jpegs and fart around with them but, basically, I don’t want to be a film processor.
Discussion

- Communication regimes
- STIN strategy
- SCOT and ANT
- Lessons for information science
- Future work
  - Collaborations with marine biologists
  - Comparisons to other fields
  - Pushing toward explanation
Contact information

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